1. For this question, initially use u = 10kt, v = 15kt, R = 5nm, and L = 100nm. Evaluate all integrals numerically with MATLAB. Assume that the target penetration point is the midpoint of the barrier.

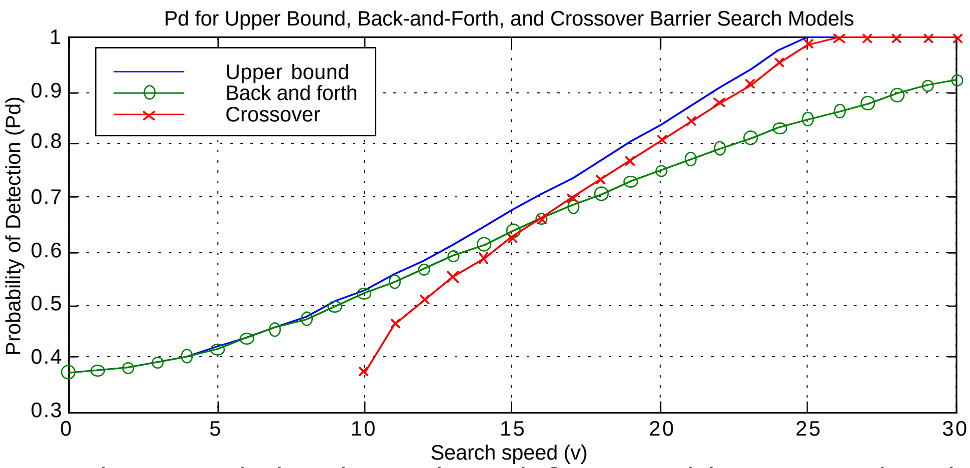
a. What is Pd? (.2003)

b. Now let R be uniformly distributed between 3nm and 7nm. What is Pd? (.2016)

c. Now set R = 5 nm and let target speed be uniformly distributed between 8kt and 12kt. What is Pd? (.2025)

c. Now let R = (U-5) nm, where target speed U is still uniform between 8kt and 12kt. What is Pd? (.1996)

2. Now assume the target's barrier crossing point is uniformly distributed across the barrier. Let u = 10kt, R = 15nm and L = 80nm. For search speeds v = [0:1:30] kt, use MATLAB to compute and plot Pd vs. v for a crossover barrier (NOA Equation (9-5)), a back-and-forth barrier (NOA Equation (9-6)) and Washburn's upper bound $\min(1, (2R/L)\sqrt{1+(v/u)^2})$, which is the minimum of 1 and NOA Equation (9-7).



3. Two options are being investigated for a 2-ship, 100 nm barrier:

Option 1.: Use two side-by-side 50 nm barriers.

Option 2.: Use two 100 nm barriers, in tandum.

If target speed (u) is 9 kt, search speed (v) is 15 kt, and detection range (R) is 12 nm, what is Pd for each option? Assume a barrier crossing point uniformly distributed across the barriers and (for Option 2) probabilistically independent searches at each barrier.
(Option 1: .9330, Option 2: .7154)

4. Assume $\sigma_x = \sigma_y$ = 5 nm, u (target speed) = 16 kt, and time late = 45 minutes. Use Matlab to:

a. plot bivariate target density for a fleeing normal target;

b. plot bivariate target density for a radially fleeing normal target;

d. verify that both densities integrate to 1 with simrule2.